A SYSTEM FOR USE IN A COMMUNICATIONS NETWORK MANAGEMENT
SYSTEM FOR AUTOMATIC MANAGEMENT OF NETWORK PLANT

   The field of the invention is that of managing
communications network plant, and more particularly that

5 of managing the integration and evolution of new network
plant by a network management system.

   Communications networks generally include a network
management system (NMS) enabling their managers or
operators to manage and monitor the plant that

10 constitutes their networks using tools executing
operation, administration, maintenance, and provisioning
(OAM&P) functions and services. In the present context,
the plant can be of any type, for example servers,
terminals, switches, routers, and concentrators, capable

15 of exchanging data with the network management system in
accordance with a network management protocol, for
example the Simple Network Management Protocol (SNMP) of
RFC 2571-2580.

   Each unit of plant includes a management information

20 base (MIB), which is also known as an object instance
base, and contains information fields whose specific
values characterize it. Also, each plant MIB is
associated with a management information base definition
(MIB definition) stored in the network management system.

25   Whenever new plant is launched onto the market, it
must have a network management application so that it can
be integrated into a network and managed by the network
operator.

   To facilitate this integration, tools such as MIB

30 browsers and NMS applications, for example, have been
developed.

   MIB browsers are tools for extracting from a plant
MIB information that characterizes the plant. They are
generally installed in a network management server which

35 also includes sets of MIB definitions, each definition
containing information for the management of one specific
unit of network plant. If the network manager requires

information that defines a particular plant unit, the
management server must load all of the MIB definitions
that correspond to the type of plant concerned, then
select the MIB definition associated with the designated
5   unit, and finally request the MIB browser to find in the
MIB of that unit the information that characterizes it.
That information is then communicated by the management
server to a graphical user interface of the NMS, so that
the manager can take note of it and act accordingly.

10   MIB browsers have the advantage of requiring no
programming once they have been installed in the
management server. They are therefore easy to install
and allow rapid integration of plant whose descriptors
are already installed in the management server. However,
15   they constitute a closed approach in that they cannot
evolve to provide improved management services.

NMS applications are tools that present "views" of
the network plant on a graphical user interface. To be
more precise, these tools include sets of descriptors,
20   each including data designating a type of network plant,
data designating the necessary codes, which are
generally in Java, for managing that type of plant and
in particular for implementing a number of interfaces, as
well as, where applicable, a set of configuration files,
25   for example XML (eXtended Markup Language) files
containing information for managing a type of network
plant. When this kind of descriptor receives from the
NMS a request designating plant of the type that it
manages, it has a browser of the NMS extract from the MIB
30   of the designated plant the values of certain of its
fields, and then delivers to the NMS the data
representative of the values extracted.

The above kind of NMS application using XML
description files is described in the document "A
35   Framework for Fieldbus Management Using XML
Descriptions", by Martin Wollschlager, published in
"Factory Communication Systems, 2000, Proceedings, 2000

IEEE International Workshop, Opporto, Portugal, 6-8 Sept., 2000", for example

They are based on programming for efficient integration of plant into the network. It is therefore

5   possible to have them evolve in such a manner as to provide improved management services. However, they must be programmed again each time that a new plant type has to be integrated, which significantly increases integration times and therefore costs.

10   Consequently, no prior art tool is truly satisfactory in terms of both integration time and capacity to evolve.

An object of the invention is to remedy some or all of the drawbacks previously cited.

15   To this end it proposes a system for managing management data of plant of a communications network, each unit of plant including à management information base containing values of fields and associated with a management information base definition including fields

20   and accessible in a network management system.

The system is characterized in that it includes at least one automatic descriptor that includes first data designating at least one type of network plant and second data designating management information base definitions

25   associated with said plant type, and is adapted, in the event of receiving data designating said type of plant, to access the fields of said management information base definitions associated with the designated type and then to deliver third data representative of the fields of the

30   plant of the designated type.

In the present context, the term "automatic descriptor" means a descriptor of the type discussed in the introduction (i.e. including a set of program code files, preferably in Java, for implementing a number of

35   interfaces, and a set of configuration files, for example XML files, containing information for managing a type of network plant), but also including a file of program

codes including first data designating at least one plant type and another file of program codes including second data designating MIB definitions associated with plant of said type.

5   According to another feature of the invention, the system can include a set of non-automatic descriptors in addition to the automatic descriptor.

According to a further feature of the invention, the automatic descriptor is preferably adapted, in the 10   event of receiving data designating an address of a plant unit of the designated type, to access the fields of the management information definition associated with the designated plant unit, then to command extraction from the management information base of the designated plant 15   of the values of at least some of the fields contained in the definition, and then to deliver third data representative of the extracted values.

If the management information bases of the plant take the form of a tree associated with at least one 20   table, the automatic descriptor is preferably adapted to deliver third data in the form of a tree and at least one table including the extracted field values.

The automatic descriptor is preferably adapted to extract the field values from the management information 25   bases of the plant of the network.

The automatic descriptor can include fourth data designating a graphical representation such that the third data can be displayed in a chosen format.

The invention also provides a management server of 30   a communications network including plant wherein each plant unit includes a management information base (MIB) that contains values of fields and is associated with a management information base definition including fields, which server is characterized in that it includes a 35   management system of the type defined hereinabove.

The invention further provides a method of managing management data of plant of a communications network

wherein each plant unit includes a management information base containing values of fields and associated with a management information base definition including fields and accessible in a network management system.

5   The method is characterized in that it consists in providing an automatic descriptor including first data designating at least one type of plant of the network and second data designating management information base definitions associated with the type(s) of plant and, in

10 the event of designation of a type of plant, using the automatic descriptor to access the fields of the management information base definitions associated with the designated type and then delivering third data representative of fields of plant of the designated type.

15 The method according to the invention can have the following complementary features in particular, either separately or in combination:

- in the event of designating an address of a plant unit in addition to its type, the automatic descriptor

20 can be used to access the field of the management information base definition associated with the designated plant and the values from at least some of the fields contained in the definition are extracted from the management information base of the plant designated by

25 the address received, after which third data representative of the extracted values is delivered,

- in the case of management information bases taking the form of a tree associated with at least one table, the automatic descriptor can be used to deliver

30 third data in the form of a tree and at least one table including the extracted field values,

- if the automatic descriptor includes fourth data designating a graphical representation, the third data can be displayed in a chosen format corresponding to the

35 graphical representation.

The invention can in particular be used in all network technologies that must be managed, and

particularly in transmission networks (for example WDM, SONET, SDH networks), data networks (for example Internet-IP or ATM networks), or voice networks (for example conventional, mobile or NGN networks).

5   Other features and advantages of the invention become apparent on reading the following detailed description and on examining the single figure of the appended drawing, which is a diagram showing an example of a communications network equipped with a management

10   system according to the invention installed in a network management server. The figure is for the most part of a specific nature and consequently constitutes part of the description of the invention as well as, if necessary, contributing to the definition of the invention.

15   The invention proposes a network management system intended to provide the manager of a communications network with fast and simpler access, via the network management system, to management information on network plant to be managed and/or configured.

20   In the example shown in the figure, the management system 1 is installed in a management server 2 of the network management system NMS, to be more precise in its management module 10. However, it could be installed in an external unit connected to said management server 2,

25   which is connected to a management terminal 3 of the network manager which is equipped with a graphical user interface (GUI) 4. In the example shown, there is only one management server 2. However, a NMS including a plurality of management servers can be envisaged, each of

30   the servers being equipped with a management system 1, for example to enable each server to manage a portion of the network plant.

The communications network includes several kinds of network plant 5, for example servers, terminals, switches

35   or routers, which can exchange data with the NMS, and in particular with its management server 2, in accordance with a network management protocol. Each unit of the

plant 5 conventionally includes a management information base (MIB) 6, which is also known as an object instance base.

Each MIB 6 includes information fields whose
5   specific values characterize the associated plant. Moreover, each MIB is associated with a management information base definition (MIB definition) 7, which is stored in the NMS and accessible to the management server 2, and in particular to its management module 10.

10   A MIB definition 7 generally defines, for the plant concerned, all its possible attributes, a type of data (string, integer, *etc.*), a naming scheme (which is generally organized in the form of a tree associated with one or more tables), text defining the plant (or object),
15   access rights, a hierarchy of the objects (or plant), and so on.

For example, an attribute (or field) can be defined as indicated hereinafter in an MIB definition 7:
sysDescr OBJECT-TYPE
20   SYNTAX DisplayString (SIZ (0...255))
            ACCESS read-only or read/write
            STATUS Mandatory
            DESCRIPTION
                        "A textual description of the plant
25   (or entity). This value must include
                        the full name and the identification
                        of the version of the type of
                        hardware of the system, of the
                        software of the operating system, and
30   of the network software. It is
                        mandatory that it contain only
                        writable characters, in ASCII codes."
            : := {system 1}
The above MIB definitions 7 conform to the RFC 1213
35   standard.

Hereinafter, it is considered by way of non-limiting example that the communications network is of the

Internet Protocol (IP) type and that the network
management protocol is the Simple Network Management
Protocol (SNMP) of RFC 2571-2580. Of course, the
invention applies to other types of network, for example

5   WDM, SONET or SDH transmission networks, ATM data
networks, and conventional, mobile or NGN voice networks,
and to other network management protocols, for example
the TL1, CORBA, and CMISE/CMIP protocols.

The management system 1 includes an automatic

10   descriptor 8 including first data that designates one or
more types of network plant 5 and second data that
designates the MIB definitions associated with the plant
of each type.

An automatic descriptor consists of a set of program

15   code files, preferably in Java, for implementing a number
of interfaces, and a set of configuration files, for
example XML files, that contain information for managing
one or more types of network plant 5. Its general
structure is therefore similar to that of a conventional

20   descriptor. However, unlike conventional descriptors,
which are associated with one and only one unit of
network plant, it is generic because it includes a basic
structure suitable for all network plant and coupled to a
first file containing data that designates one or more

25   plant types and to a second file containing data that
designates the MIB definitions associated with plant of
the type concerned. Thanks to this original structure,
the automatic descriptor 8 can be adapted to any type of
plant, as it suffices to modify the data in the first

30   file that designates the type of plant and the data in
the second file that designates the MIB definitions 7
associated with plant of the type concerned.

Thanks to the structure described hereinabove, when
it receives from the management module 10 of the

35   management server 2, at the request of the management
terminal 3, data that designates the type of plant 5 for
which it is configured, the automatic descriptor 8 can

access the fields of the MIB definitions 7 in the NMS
that are associated with the designated type and deliver
third data representative of the fields of the network
plant 5 that belongs to that type. Once it has obtained
5 the third data, the management server 2 can supply it to
the graphical user interface 4 of the management terminal
3, via the management server 2, so that the network
manager can view it in the form of a tree showing the
various units of the network plant 5, grouped according
10 to the type initially requested.

If the network manager wishes to obtain information
on one unit of the plant 5 of the type originally
requested, in other words to obtain details on a portion
of the displayed tree, he sends the address of the plant
15 to the management module 10 of the server 2 via his
graphical user interface (GUI) 4. The management module
10 sends the address to the automatic descriptor 8 which
manages plant of the type to which it belongs.

The automatic descriptor 8 receives the designation
20 of the address of a unit of the plant 5 whose type it
manages and accesses the MIB descriptor 7 associated with
the unit in order to determine the fields for which it
will have to obtain specific values (contained in the MIB
6 of the plant). It then knows what attributes and/or
25 tables exist in the MIB 6 of the unit of the plant 5.
For example, once the automatic descriptor 8 knows that
the field (attribute) "sysDescr" previously defined
exists, it has only to obtain its value, which is equal
to "router No.1", for example, and which is contained in
30 the MIB 6 of the unit of the plant 5.

Once the automatic descriptor 8 is in possession of
the "behavior" of the unit of the plant 5, it looks up in
the MIB 6 of the unit the specific values of the fields
extracted from the MIB definition 7 associated with the
35 unit.

The values of the fields are preferably extracted
from the MIB 6 using the SNMP. However, they could

equally well be extracted using another management protocol, for example the CMISE/CMIP, CORBA, or TL1 protocol.

These field values constitute third data that is
5   supplied by the interrogated unit of the plant 5 to the automatic descriptor 8 and then communicated to the management terminal 3 so that it can be displayed in a format defined by the automatic descriptor 8.

It is possible to use the automatic descriptor 8
10   either on the server side and the client side or only on the server side. In the former case, the third data is displayed in the form of a tree and at least one table containing the extracted field values, if the MIBs 6 of the plant 5 are arranged in this way. To achieve this,
15   it suffices for the browser module 9 to be similar to a microcomputer browser, being specifically dedicated to displaying the alarm state for each object or plant represented.

In the latter case, there is added to the automatic
20   descriptor 8 a complementary file including fourth data that designates a chosen graphical representation addressed to the graphical user interface (GUI) 4. This graphical representation corresponds to a particular display format that enables the display of the third data
25   on the screen of the management terminal 3 to be adapted as a function of the plant concerned, to be more precise its inherent characteristics.

In these two embodiments, the fourth data that designates the graphical representation is sent to the
30   management module 10 of the management server 2, which is capable of arranging the third data supplied at the same time by the automatic descriptor 8 in the format defined by the designated graphical representation. The third data is then sent to the graphical user interface 4 of
35   the management terminal 3 and displayed.

This facilitates the processing by the network manager of the information that defines the plant

displayed.

In the foregoing description, a management system 1 is installed in the management server 2 and includes at least one automatic descriptor 8 able to extract data from the MIBs 6 of the plant 5 that it manages and to cooperate with a browser module 9 of the graphical user interface (GUI) 4 of the manager of the network to display extracted data in a chosen format. A management system of the above kind can therefore be installed in a prior art management server already equipped with an MIB browser and conventional descriptors. In this case the automatic descriptor 8 of the invention replaces the conventional descriptors and cooperates with the browser module of the graphical user interface (GUI) 4.

The invention also provides a method of managing management data of communications network plant 5, each unit of the plant including an MIB 6 associated with an MIB definition 7 accessible via an NMS.

The latter method can be implemented by the management system 1 described hereinabove. The main functions and the optional sub-functions of the steps of the method being substantially identical to those of the various means constituting the management system 1, only the steps implementing the main functions of the method according to the invention are summarized hereinafter.

The method is characterized in that it consists in providing at least one automatic descriptor 8 of the type previously described and, in the even of designation of a type of plant 5 managed by the automatic descriptor 8, using the latter to access the fields of the MIB definitions 7 associated with the designated type and then to deliver third data representative of the fields of the plant 5 of the designated type.

If the address of a unit of the plant 5 is designated in addition to its type, it is preferably possible, using the automatic descriptor 8, to access the field of the MIB definition 7 which is associated with

the designated unit and then to extract from the MIB 6 of the designated unit the values of at least some of the fields contained in the MIB definition 7 that is associated with it, after which third data representative

5   of the extracted values can be supplied.

The invention is not limited to the embodiments of the method, management system, and management server described hereinabove by way of example only, but encompasses all variants that the person skilled in the

10   art might envisage that fall within the scope of the following claims.

Thus a network has been described in which the network management system NMS includes only one management server equipped with a network management

15   system NMS according to the invention adapted to manage all the plant of the network. However, the network management system could include a plurality of management servers each equipped with a management system according to the invention for managing a portion of the plant of

20   the network.

Moreover the system according to the invention can be incorporated into a prior art management system using conventional descriptors, in which case its automatic descriptor complements said conventional descriptors.

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